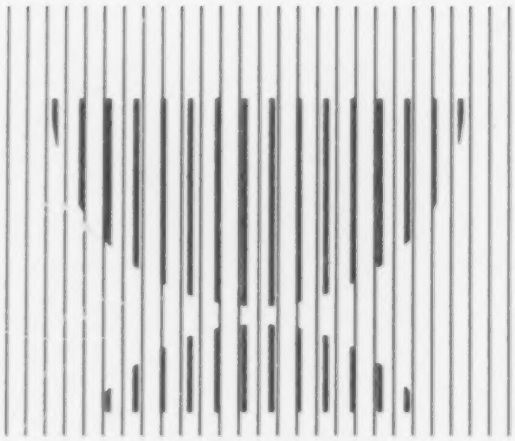
CBO STAFF MEMORANDUM

USING B-2 BOMBERS FOR CONVENTIONAL NAVAL MISSIONS

September 1991



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This memorandum was prepared by the Congressional Budget Office (CBO) in response to a request from the Chairman of the Defense Subcommittee of the Committee on Appropriations of the U.S. House of Representatives. The Chairman requested information on the costs of several Navy and Air Force aircraft and an evaluation of using the B-2 bomber to perform naval missions instead of buying new aircraft for the Navy. In keeping with CBO's charter to provide objective and nonpartisan analyses, the memorandum makes no recommendations.

The cost analysis of the Administration's program and alternatives was performed by William P. Myers and Raymond Hall under the supervision of Michael A. Miller. Lane Pierrot constructed the alternatives and evaluated their impact under the supervision of Robert F. Hale and R. William Thomas. Michael Berger, David Mosher, Michael O'Hanlon, and Chris Garmon made a variety of useful comments that were incorporated into the analysis. Sherwood Kohn edited the manuscript. Janice M. Johnson prepared it for publication.

NOTE:

Unless otherwise indicated, all years referred to in this report are fiscal years.

Details in the text and tables may not add to totals because of rounding.

Unless otherwise indicated, all costs are expressed in billions of fiscal year 1992 dollars of budget authority.

INTRODUCTION AND SUMMARY

The Department of Defense (DoD) may have considerable difficulty financing all its planned purchases of weapons during the remainder of this decade and into the next. In the mid-1990s, the overall DoD budget might decline by more than is now planned as the Congress and the Administration seek ways to adhere to the limits on federal spending established in the Budget Enforcement Act of 1990.[1] Additional reductions in the total DoD budget would surely reduce funds available for procurement of new weapons. Moreover, particularly in the early years of the next decade, DoD expects to begin procurement of a variety of new weapons, many of which will be quite expensive. This could strain procurement budgets even if there are no decreases in funding beyond those now planned.

In such a budgetary environment, it may be impossible to develop and buy a new type of weapon to replace each older class of weapon. Instead, DoD may have to evaluate ways in which the weapons it does buy can perform additional missions.

One Approach: Greater Reliance on B-2 Aircraft

One example of such an approach would involve using the Air Force's B-2 bomber, which was designed primarily to accomplish strategic bombing missions, to carry out some conventional bombing missions that are currently performed by aircraft based on the Navy's aircraft carriers. The Air Force argues that the B-2 bomber, a stealth plane designed to avoid enemy radar and other sensors, has the capability of performing a variety of long-range conventional missions.[2] According to the Air Force, B-2 bombers based in the continental United States, Guam, or Diego Garcia and refueled in flight could bomb targets anywhere in the world.

If the B-2 bomber surmounts reported performance problems and is able to perform these missions, the Navy might be able to forgo development and purchase of its new AX attack aircraft, a carrier-based aircraft designed to carry out conventional bombing missions. The Navy might also be able to cancel its plans to develop and buy the new E/F version of the F/A-18 fighter bomber, which would have greater range than today's F/A-18 aircraft. Finally, if B-2 bombers can accomplish a substantial portion of conventional bombing missions, the Navy might need fewer aircraft carriers.

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1. See Testimony of Robert F. Hale before the Senate Budget Committee, July 16, 1991.

2. "The Air Force and U.S. National Security: Global Reach-Global Power" (U.S. Air Force white paper, June 1990), pp.8-10.

Summary of Key Results

This memorandum cites arguments for and against relying on B-2 bombers to carry out conventional bombing missions now performed by carrier-based aircraft. Carrier-based aircraft can conduct repeated attacks on nearby targets during a relatively short period. The Navy contends that B-2 bombers based in the United States would not be well suited for such attacks if they had to return to distant bases to rearm. Also, B-2 bombers would not be accompanied by carrier-based fighter, electronic warfare, and early warning aircraft that might be useful in some combat situations. If greater reliance on B-2 bombers leads to the cancellation of plans to equip carriers with the new AX aircraft, the capability of carriers may be reduced.

In addition, if greater reliance on B-2 bombers leads the United States to maintain fewer carriers than the 12 ships now planned, the country's ability to use carriers to "show the flag" in peacetime may be diminished. A reduction in the number of carriers might also lessen U.S. capability to carry out some missions that cannot be performed effectively by B-2 bombers, such as establishing and maintaining air superiority in local areas. Finally, there would be fewer carriers to demonstrate U.S. military commitment in time of crisis, a display that would be difficult with B-2 bombers based in the United States.

There are, however, a number of arguments in favor of increased reliance on B-2 bombers. The Air Force contends that the long-range capability of B-2 bombers enables them to undertake worldwide bombing missions on short notice and without giving potential adversaries much warning. In addition, the stealth characteristics of the B-2 aircraft would, according to the Air Force, eliminate the need for the fighter escorts that normally accompany carrier aircraft.

Greater reliance on B-2 bombers could also reduce costs. Alternative 1 in this memorandum assumes that, because of increased reliance on B-2 aircraft, the Navy would cancel its plans to develop and procure the AX. Alternative 1 also assumes that the Navy would cancel development and purchase of the new E/F version of the F/A-18 aircraft, although purchases of the existing C/D version would continue. Under this alternative, acquisition costs in the years 1992-2010 would decline by between $44 billion and $60 billion, compared with costs under the Administration's plan. Operating costs would decline by between $0.2 billion and $0.7 billion a year. The larger savings result from the assumption that no additional B-2 bombers would be purchased to carry out the new mission of conventional bombing. The smaller savings result from the assumption that 45 additional B-2 bombers would be purchased.

Savings would be considerably larger if reliance on B-2 bombers permits the United States to maintain fewer aircraft carriers. Alternative 2 in this memorandum assumes that the Navy would keep only nine aircraft carriers (compared with twelve under the Administration's plan), in addition to canceling the AX aircraft and the E/F version of the F/A-18 aircraft. Compared with costs under the Administration plan, savings in acquisition costs in the 1992-2010 period would range from $87

billion to $102 billion. Operating savings would increase to between $4.3 billion and $4.8 billion a year.

Under both alternatives, much of the acquisition savings is associated with cancellation of the AX aircraft. The bulk of the AX savings would not be realized until the early part of the next decade, when the plane would enter the procurement phase. The magnitude of savings also depends on Congressional Budget Office (CBO) assumptions about the nature of the Administration's plan for naval aviation in the next decade, which has not been made public in detail.

ADMINISTRATION'S PLAN

In order to compare costs of the Administration's plan with those of the alternative approaches, this memorandum describes the aircraft and ships to be bought and then estimates the costs of the armaments.

Description of Aircraft

The Administration's plan includes funding for three aircraft that are the focus of this analysis: the Navy's AX and the E/F version of the Navy's F/A-18, and the Air Force's B-2.

The AX medium attack aircraft is designed to provide the Navy with a highly stealthy aircraft; that is, one that can avoid detection by enemy radar and other sensors. The stealth characteristics of the AX may greatly improve its ability to survive enemy defenses. The Chief of Naval Operations recently testified that in computer simulations of possible future Middle East combat situations, nonstealth aircraft were lost to enemy attack at rates at least six times greater than those for stealth aircraft.

The Navy also wants an AX aircraft that can attack distant targets and carry substantial payloads.[3] The range of the AX aircraft is expected to exceed that of the A-6 medium range bomber, the plane the AX will replace. The A-6 has the longest range of all the Navy's tactical aircraft. If AX aircraft have payloads comparable to those of the A-6, they might be able to carry twenty-eight 500-pound bombs, a substantial load.[4]

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3. See statement of Robert F. Hale before the Subcommittee on Defense, Committee on Appropriations, U.S. Senate, May 8, 1991 for a more detailed description of the costs and capabilities of the F/A-18 and the AX.

4. *Jane's All the World's Aircraft*, (London, England: Jane's Publishing Company, various editions), are the source for the payloads described here. The Navy provided estimates of ranges for the A-6, AX, and various versions of the F/A-18. These numbers are illustrative, and estimates for specific bombing runs can vary considerably, depending on a variety of assumptions. The capacity to carry Precision Guided Munitions (PGMs) could be considerably lower for all of these aircraft. In

The Administration's plan for development and procurement of the AX is the least defined of its plans for the three key aircraft cited in this analysis. The Navy will begin AX development in 1992 and the plane may begin entering procurement around the turn of the century, according to press reports.

The F/A-18 aircraft is designed to function as a fighter and as an attack aircraft. The Navy has already purchased a substantial number of the C/D version of the F/A-18 aircraft. Now the service intends to develop an E/F version that would have greater range and be able to carry larger payloads than the C/D version. The Navy expects to begin developing the E/F version in 1992 and to begin procurement in 1996. Both the F/A-18 and AX aircraft are expected to carry a variety of precision-guided munitions (PGMs); munitions that are guided to their targets rather than falling freely. PGMs apparently were much more effective in the Gulf war than unguided bombs.

The Air Force's premier new strategic bomber, the B-2, would be designed to be quite stealthy. Its range would also be much greater than either of the Navy's two tactical aircraft, and it would have a larger maximum payload than the AX. Currently, however, the B-2 bomber cannot launch the present generation of precision-guided munitions. The Air Force is developing a new, stealthy cruise missile, the Tri-service standoff attack missile (TSSAM), that can be carried by the B-2 bomber.[5] The TSSAM program has only recently been declassified and the Air Force has not yet publicly announced deployment schedules for the missile.

The B-2 is in production. Through 1991, the Congress has authorized funds for 6 test planes and 10 production versions of the aircraft.[6] The Air Force plans to buy 75 B-2 bombers, which will permit the service to field two wings, each with 34 planes, by the middle of the next decade.[7]

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addition, the effectiveness of PGMs is dependant upon guidance from the launching aircraft or other source. The constraints of the pilot's attention span and of guidance technology may limit the numbers of PGMs that can be guided simultaneously to targets.

5. A U.S. Air Force Fact Sheet, dated June 3, 1991 announced some details about the formerly highly classified program. Despite the fact that the missile is in the later stages of development, there may still be reason to question how soon and for what mission the missiles will be available. One concern might relate to the program cost of the missile, which is about $1.7 million each in current dollars.

6. Five of the six test B-2s are supposed to be modified eventually to make their configurations similar to the production aircraft.

7. The Air Force expects about 90 percent of the B-2s bought to be in operating wings.

Description of Ships

In order to support the planned fleet of 12 aircraft carriers, the Navy must buy a number of types of ships. The Navy would need several new aircraft carriers to replace older vessels that will be retired. The Navy would also have to buy DDG-51 guided missile destroyers, the primary surface combatant that accompanies aircraft carriers. In a war, the *Arleigh Burke* class DDG-51 would be used to protect carriers and the other ships in a battle group and to attack land- and sea-based targets. Attack submarines also are part of carrier battle groups. The Navy's attack submarine fleet performs a variety of missions, including defending carrier battle groups against attacks by enemy submarines. The Navy is currently buying the SSN-21 submarine, a highly capable but costly ship, in order to modernize its fleet of attack submarines. The Navy has stated, however, that it will study the possibility of designing a cheaper attack submarine as a successor to the SSN-21 submarine.

Costs of the Plan

This memorandum spells out estimates under the Administration's plan for both acquisition and annual operating costs. Acquisition costs in this memorandum include funds for development and procurement of ships and aircraft during the period 1992-2010. Annual operating costs are defined as the total costs of operating, for one year, all the forces associated with ships and aircraft purchased during the period 1992-2010.[8] Thus, the measure of operating costs used in this memorandum is a "steady state" measure that ignores costs during the years when ships and aircraft are entering the fleet, focusing instead on costs during years when all the ships and aircraft considered in this memorandum have been deployed. Operating costs include pay for the personnel who operate the ships and aircraft as well as other day-to-day operating costs. Operating costs also include indirect costs that can be attributed to ships and aircraft, such as those for training and depot maintenance.

Acquisition Costs. Acquisition costs for the three types of aircraft that are the focus of this analysis total $104 billion (see Table 1). (Unless otherwise noted, all costs are expressed in constant 1992 dollars of budget authority.) About one-third of the total of $104 billion pays for the remaining costs of developing and procuring the Air Force's B-2 bomber. The other two-thirds pay for development and purchase of the two Navy aircraft.

Acquisition costs for ships to support the Navy's 12-carrier fleet total $152 billion (see Table 1). This includes purchases of all types of ships--carriers, surface combatants, auxiliaries, and attack submarines--associated with the Administration's planned fleet of 12 aircraft carriers. Acquisition costs for ships and aircraft total $256 billion.

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8. Operating costs are for the forces associated with the Navy's 12 carrier battle groups. They also include the costs of operating the Navy's attack submarine fleet.

TABLE 1. COSTS UNDER THE ILLUSTRATIVE ADMINISTRATION PLAN FOR SELECTED AIRCRAFT AND SHIPS
(In billions of 1992 dollars)

	Acquisition in 1992-2010		Annual Operating Cost
	Number	Cost	
Aircraft[a]			
B-2	65[b]	30.9	0.9
AX	370	48.3	0.7
F/A-18 E/F	372	25.1	0.8
Total Aircraft	807	104.3	2.4
Ships[c]			
Total Ships	175	152.4	12.0

SOURCE: Congressional Budget Office.

a. The Navy's air wings would eventually contain about 480 aircraft in addition to the AX and F/A-18s. Annual operating costs for these planes would amount to about $2.0 billion.
b. Five of the 65 aircraft are R&D planes that will be modified to operational configurations.
c. Acquisition and Operating costs for ships include those associated with the Navy's carrier battle groups and all attack submarines.

These acquisition costs reflect expected purchases of selected ships and aircraft through the year 2010. The Air Force has stated it plans to buy 65 B-2 bombers during that period.[9] The Navy, however, has not released its procurement plans beyond 1997. Therefore, the costs in this memorandum reflect the details of the Administration's naval plan through 1997. Between 1997 and the year 2010, procurement is based on CBO estimates. CBO's estimates assume the purchase of enough ships and aircraft to maintain the Administration's planned 12 aircraft carriers, and to meet other naval aircraft needs through the year 2010. (The choice of the year 2010 is arbitrary but seemed to provide a reasonable basis for assessing the effects of the alternatives in this memorandum.) Specifically, CBO assumes the purchase during the years 1992-2010 of 65 B-2 aircraft, 370 AX aircraft, and 372 of the E/F version of the F/A-18 aircraft. Ship purchases during this period include 4 aircraft carriers, 60 DDG-51 destroyers, and 46 attack submarines. Most of the remaining 65 ships provide logistics support for the Navy's combat vessels.

While CBO has attempted to capture a likely version of the Administration's program, future Administration plans are uncertain, particularly those for naval aircraft. The Navy's plans for aviation have been thrown into considerable disarray over the past few months. The cancellation of the A-12 aircraft, and the rapid development of plans for its successor, the AX, leave questions about when and how many AX aircraft will be purchased. Nor are the uncertainties limited to the AX. The Navy's decision to forgo procurement of a variant of the Air Force's Advanced Tactical Fighter leaves unanswered many questions about what the service will buy to replace its top-of-the-line fighter, the F-14. The Navy currently plans to buy more F/A-18 aircraft as an interim replacement. Eventually, however, the Navy may decide to develop an AX that has fighter as well as attack capability, especially if the stealth characteristics of the AX are highly valued. This uncertainty makes it difficult to estimate how many of the E/F model of the F/A-18 will be purchased. The results of the analysis in this memorandum could vary considerably if the Navy develops procurement plans that make different assumptions than those contained in the memorandum.

In arriving at the procurement portion of acquisition costs, CBO had to make assumptions about the unit costs of future ships and aircraft. The B-2 is the most costly of the aircraft examined in this memorandum, with an expected procurement cost of $540 million each. The AX aircraft is assumed to cost about $100 million, about the same as the estimated cost of the recently terminated A-12 aircraft. Based on a recent Administration report, CBO estimated the cost of the E/F model of the F/A-18 at about $60 million apiece, about 50 percent more than the C/D model. Aircraft carriers are assumed to cost $4 billion each. The Navy is studying new designs for less expensive destroyers and submarines, and CBO assumed that the service would successfully design less expensive vessels by the middle of the next decade. CBO assumed that new destroyers and submarines would cost $0.6 billion and $1.4 billion, respectively, rather than the current costs of $0.8 billion and $2.0 billion.

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9. Five of these aircraft are development planes that are to be modified to operational configurations.

Operating Costs. CBO also estimated the annual operating costs of ships and aircraft examined in this study. Annual operating costs for aircraft amount to $2.4 billion (see Table 1). Annual costs for the ships specified in the alternative plan total about $12 billion. Together, the ships and aircraft mentioned in this memorandum would cost $14.4 billion a year to operate.

These estimates of operating costs are based on a number of assumptions. CBO assumed that carrier air wings will contain 20 AX aircraft and 20 of the E/F model of the F/A-18s, a mix that is roughly consistent with the procurement assumptions made in this memorandum.[10] Eventually, however, the Navy may plan to have more of the E/F models in its air wings. It may also eventually replace the F-14 aircraft with a new fighter. These choices would affect operating costs.

Because complete data on operating costs are often not available, CBO made a number of assumptions about the costs of operating various types of aircraft. CBO used the annual operating costs of A-6 aircraft as a proxy for the cost of operating the AX; the C/D model of the F/A-18 served as a proxy for the E/F model. Operating costs for the B-2 bomber are based on information supplied by the Air Force that suggest that the B-2 aircraft will cost 30 percent more to operate than it now costs to operate a comparable number of B-1 bombers.

Additional Detail. The appendix to this memorandum contains much more detail about acquisition and operating costs. Information in Table A-1 about aircraft acquisition costs was taken directly from Administration documents. CBO made no assumptions about future purchases of Navy aircraft for Table A-1. Table A-2 contains the detail underlying the summary numbers in Table A-1 and does reflect CBO assumptions about how many ships and aircraft would be purchased. Table A-2 also shows costs in inflated dollars. Both Tables A-1 and A-2 contain requested information about aircraft other than those discussed in this memorandum.

ALTERNATIVE 1. RELY ON B-2 BOMBERS FOR SELECTED MISSIONS

This first alternative to the Administration's program would maintain the Navy's planned fleet of 12 aircraft carriers but would equip them with aircraft that are less capable than those the Navy now plans to buy. B-2 bombers based in the United States would be used to attack the most highly defended targets. Aircraft carriers would still be used for many missions other than attacking enemy targets and for attacks against less highly defended targets.

This option would end further development and procurement of the Navy's AX aircraft, which is designed to attack the most highly defended targets. In addition,

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10. About 480 various aircraft will eventually comprise the Navy's carrier air wings, in addition to the F/A-18s and AXs that are the focus of this study. This estimate assumes that the Navy would eventually field a standard wing containing about 84 aircraft. These other aircraft would cost about $2 billion per year to operate.

the alternative would end development of the E/F version of the F/A-18 aircraft, which is designed to have greater range than the existing C/D version. Purchase of the existing C/D version would continue, however, in order to provide the Navy with carrier aircraft that can attack enemy targets.

For this option, CBO has made two different assumptions about how many B-2 bombers are purchased. In the first case, no extra B-2 bombers are bought. This is consistent with the assumption that the planned acquisition of 75 B-2 bombers would provide enough planes to accomplish necessary strategic missions while also being available to attack highly defended conventional targets. In the second case, additional B-2 bombers are bought to carry out the conventional mission.

Cost Savings

Compared with the Administration's plan, this alternative would reduce total acquisition costs between 1992 and 2010 by $44 billion if additional B-2 bombers are bought, or by $60 billion if no extra B-2 bombers are purchased (see Table 2). These savings would represent between 17 and 23 percent of costs under the Administration's plan. Most of the savings are associated with cancellation of the AX aircraft. Thus, most of the savings would be realized in the next century, when AX aircraft would have been bought.

In addition to reducing acquisition costs, this alternative would reduce operating costs by between $0.2 billion and $0.7 billion a year below the level under the Administration's plan. Larger savings would be achieved by not buying additional B-2 bombers. Estimates of reduced annual operating costs assume that all the changes envisioned under this alternative are fully in place. Because aircraft remain in the fleet for many years--operating lifetimes often range from 20 to 30 years or more--the cumulative reduction in operating costs under this alternative could be substantial.

Buy Additional B-2 Bombers? Even under this alternative, which relies on B-2 bombers to carry out conventional as well as strategic missions, additional B-2 bombers may not have to be purchased. The Air Force has repeatedly argued that the B-2 bomber was designed to perform conventional missions. With world tension reduced, 75 B-2 bombers may be sufficient to provide the United States with the strategic capability it needs, while also being available to carry out conventional missions.

On the other hand, a decision might be made that in time of crisis, the relatively small fleet of 75 B-2 bombers would have to be devoted solely to the strategic mission. In that case, extra B-2 bombers would have to be bought to carry out conventional missions.

In estimating costs that supposed the purchase of additional B-2 bombers, CBO assumed that 45 B-2s would be procured. The basis for this number is an Air Force briefing that suggests that one B-2 bomber could perform the same mission as four F-117 fighters. This ratio is apparently based primarily on the payloads of the two

TABLE 2. COSTS AND SAVINGS UNDER ALTERNATIVE 1: RELIANCE ON B-2 BOMBERS FOR SELECTED MISSIONS

Aircraft	Changes in Acquisition 1992-2010 Number	Changes in Acquisition 1992-2010 Cost	Change in Annual Operating Cost
Buy No Extra B-2 Aircraft			
B-2	0	0.0	0.0
AX	-370	-48.3	-0.7
F/A-18 E/F	-372	-25.1	-0.8
F/A-18 C/D	372	13.5	0.8
Total	-370	-59.9	-0.7
Buy 45 Additional B-2 Aircraft			
B-2	45	15.7	0.5
AX	-370	-48.3	-0.7
F/A-18 E/F	-372	-25.1	-0.8
F/A-18 C/D	372	13.5	0.8
Total	-325	-44.2	-0.2

SOURCE: Congressional Budget Office.

NOTE: Negative numbers are savings. Positive numbers are costs.

planes.[11] The payload of the AX aircraft may be even larger than that of the F-117, if it is comparable to that of the A-6, or about a third of the B-2's payload. (The A-6 is able to carry twenty-eight 500-pound bombs and the B-2's capacity is 80.) This suggests that one B-2 might carry the payload of three AX aircraft. However, it might be feasible to replace three or more AX aircraft with one B-2 aircraft. The Navy deploys only about a third of its air wings at any one time, while about 90 percent of the force of B-2 aircraft would be available in operating squadrons. Thus, one B-2 flying from operating squadrons in the continental United States might replace about eight AX aircraft, and about 45 additional B-2 aircraft would be needed to replace the 370 AX aircraft that the Navy would buy under CBO's assumptions about the Administration's plan.

Additional Tankers. Acquisition and operating costs for this alternative (or for Alternative 2) do not include additional costs to buy and operate airborne tankers to refuel B-2 bombers on conventional bombing missions. The size of the tanker fleet posited in the Administration plan should be adequate.

Advantages and Disadvantages

The key advantage of this alternative is that it substantially reduces costs. This may be a major advantage, particularly if defense budgets continue to decline.

In addition to saving money, B-2 bombers flying from bases in the United States, Guam, or Diego Garcia would, according to the Air Force, be capable of attacking targets worldwide.[12] Because of its stealth characteristics, the Air Force believes that the B-2 bomber could evade enemy radars and fighter aircraft. Therefore, B-2 bombers would not need the fighter escorts that normally accompany carrier-launched aircraft. The Air Force also argues that the B-2's long range would permit it to perform worldwide bombing missions from a small number of bases, thus reducing the need to obtain overseas air bases or the right to fly over the territory of other nations.

Using B-2 aircraft for selected conventional missions might also permit the United States to launch attacks on shorter notice. B-2 bombers flying from bases

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11. "Air Force Stealth Technology Review," an Air Force briefing dated June 10-14, 1991. Included in the briefing is a chart that suggests that stealth enables the services to reduce dramatically the number of combat aircraft sent on bombing missions.

12. "The Air Force and U.S. National Security Global Reach-Global Power" (U.S. Air Force White Paper, June 1990). Also the "B-2 Stealth Bomber Fact Book" (Northrop Corporation, 1991). The later publication suggests that B-2s based in these three locations can bomb targets anywhere in the world, except for a small area around the south pole, with one aerial refueling. According to that publication, B-2s could bomb targets almost anywhere in the world without any refueling at all from those three locations.

in the United States would be more readily available than aircraft aboard carriers, since carriers must steam into an attack position.

Moreover, this alternative to the Administration's program retains all the carrier forces in the Navy's plan. Thus, naval forces would be available in the same numbers as those under the Administration's plan, for missions that could be accomplished without the use of such advanced aircraft as the AX. For example, naval forces would still be available for missions involving rescuing civilians from trouble spots, attacking enemy submarines, and striking targets that are lightly defended. Naval forces would also still be available to "show the flag" in peacetime and to demonstrate military commitment in time of crisis, something that would be difficult to do with B-2 bombers based in the United States.

While B-2 bombers might be able to substitute for naval aircraft carrying bombs, the Navy would argue that carrier battle groups have other capabilities that B-2 bombers lack. For instance, naval aircraft can attack targets repeatedly during a relatively short period of time. B-2 bombers are not suited to fast, repeated attacks if they have to return to distant bases to rearm. Also, attack aircraft that are launched from carriers can be accompanied by fighters, electronic warfare aircraft, and early warning aircraft which may be useful under certain combat conditions.

Moreover, although the number of aircraft carriers would not be decreased under this alternative, their capability would be significantly reduced. Because neither the AX nor a replacement aircraft would be purchased under this alternative, the number of aircraft in the Navy's air wings would gradually be reduced. Where carriers are used, this would reduce the pounds of bombs the Navy could drop on a particular set of targets in a given period. The wings would also lose their medium-range attack capability, which means that carriers might have to be positioned closer to shore, where they would be more vulnerable to shore-based threats.

An additional concern about alternatives that rely more heavily on the B-2 bomber is whether the plane will perform as well as predicted. In particular recent press reports suggest that the B-2 may not be as stealthy as the Air Force expected, or may require costly modification.[13] If the plane is not stealthy, it might not survive in high-threat environments or might require the assistance of carrier-based fighters or electronic warfare aircraft to perform its missions. Of course, the AX and F/A-18 E/F programs, which are at the beginning stages of development, might also experience degradation in performance or increases in cost.

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13. R. Jeffrey Smith, "B-2 Bomber Fails Test of Stealthiness," *Washington Post*, September 13, 1991.

ALTERNATIVE 2. HEAVIER RELIANCE ON B-2 BOMBERS

The second alternative assumes that B-2 bombers could undertake enough of the Navy's carrier missions to allow a decrease in the size of its carrier forces. This plan assumes that the Navy's carrier fleet would be reduced from twelve to nine carriers; carrier air wings would be reduced from eleven to nine wings. These levels are chosen for illustration; larger reductions could be considered.

Fewer carriers would mean that fewer ships could be deployed in peacetime, but the reduction may be acceptable under this approach. If B-2 bombers could provide timely bombing capability during rapidly evolving international crises, aircraft carriers might not be needed at all in those situations. If they are needed to provide additional air power, they might have time to steam to the area. This added time could reduce the need to keep aircraft carriers on station in peacetime, and thus reduce the total requirement for carriers. Moreover, the fleet of nine carriers assumed in this alternative would still provide a substantial fleet for maintaining a peacetime presence, mounting rescue missions, controlling the seas, and projecting military power where enemy threats and the range to targets are limited.

Like Alternative 1, this plan cancels procurement of the AX aircraft and development of the E/F version of the F/A-18 aircraft. Purchases of the existing C/D version of the F/A-18 would continue, but in smaller numbers reflecting the reduction in the number of carriers and air wings. Because of the reduction in the number of carriers, this alternative would require the purchase of fewer new carriers, surface combatant vessels, and attack submarines compared with purchases planned under the Administration's plan. In addition, this alternative assumes that the nine remaining carriers are accompanied by fewer surface combatants (typically five such ships instead of six), which may be acceptable because B-2 bombers would undertake bombing missions against the most heavily defended targets. This assumption reduces the requirement to purchase surface combatants beyond the reduction associated with having fewer aircraft carriers and would also permit the early retirement of some older surface combatants.

Cost Savings

During the period 1992-2010, acquisition costs for ships and aircraft bought under the assumptions of Alternative 2 would be reduced by between $87 billion and $102 billion compared with costs under the Administration plan (see Table 3). The range depends on whether or not 45 additional B-2 bombers are purchased. Under this acquisition plan, savings would amount to between 34 percent and 40 percent of the Administration program's total costs for buying the ships and aircraft that are the focus of this memorandum.

Compared with Alternative 1, almost all of the additional savings under Alternative 2 would result from reduced purchases of ships. A relatively small

TABLE 3. COSTS AND SAVINGS UNDER ALTERNATIVE 2: HEAVIER RELIANCE ON B-2 BOMBER[a]

Weapon Systems	Changes in Acquisition 1992-2010 Number	Cost		Change in Annual Operating Cost
Buy No Extra B-2 Aircraft				
B-2	0	0.0		0.0
AX	-370	-48.3		-0.7
F/A-18E/F	-372	-25.1	Net change	
F/A-18 C/D	312	11.1	to F/A-18	-0.1
Other aircraft [b]	--	--		-0.4
Ships	-54	-39.9		-3.6
Total	n.a.	-102.2		-4.8
Buy 45 Additional B-2 Aircraft				
B-2	45	15.7		0.5
AX	-370	-48.3		-0.7
F/A-18 E/F	-372	-25.1	Net change	
F/A-18 C/D	312	11.1	to F/A-18	-0.1
Other aircraft [b]	--	--		-0.4
Ships	-54	-39.9		-3.6
Total	n.a.	-86.5		-4.3

SOURCE: Congressional Budget Office.

NOTES: n.a. = not applicable
Negative numbers are savings. Positive numbers are costs.

a. Includes only the aircraft and ships changed in the alternative.
b. Planes associated with two carrier air wings, excluding AX and F/A-18s.

amount of the additional savings would be realized because about 60 fewer F/A-18 aircraft would be needed to equip the reduced number of carrier air wings.

As was the case under Alternative 1, the bulk of the acquisition savings would be realized in the next decade. In that period, there would be no need to purchase the AX aircraft. Purchases of F/A-18 aircraft and ships would also be smaller.

Operating and support costs would also be substantially lower under this alternative than under the Administration's plan. Compared with that plan, annual operating costs would be reduced by between $4.3 billion and $4.8 billion, with the larger figure arrived at by assuming no additional purchase of B-2 aircraft. Operating savings under this alternative are substantially larger than under Alternative 1 because ship operating costs would drop as the size of the carrier fleet is reduced. These annual operating savings would accumulate over a long period because ships often remain in service for many years, and aircraft have a life of several decades. Thus, the total savings in operating costs under this alternative could eventually exceed the money saved by reductions in acquisition costs.

Advantages and Disadvantages

Many of the same advantages and disadvantages associated with Alternative 1 apply to Alternative 2. Sometimes they are even more significant. This alternative saves significantly more money than Alternative 1, potentially a major advantage. On the other hand, this alternative relies more heavily on B-2 bombers than Alternative 1. Thus, some of the disadvantages of Alternative 1, such as the limited ability of B-2 bombers to attack targets repeatedly and reported questions about the bomber's stealth capability, would be of greater concern.

Alternative 2 also has some unique disadvantages. Under this approach, the Navy would have fewer carriers at sea in peacetime. The Navy argues that the presence of carriers in peacetime demonstrates U.S. interest and resolve, exerting a stabilizing influence that may prevent diplomatic crises from escalating to military action. Fewer carriers at sea in peacetime could also delay the Navy's arrival in time of crisis. Whether such a delay would be significant would depend on the nature of the crisis.

Carrier battle groups also perform some other missions that B-2 bombers cannot perform. For example, with fewer carrier battle groups, the Navy might find it difficult to establish local air superiority, which could be necessary to protect non-stealth aircraft, support Marine landing operations, and establish local sea control in order to secure the supply lines necessary for deploying additional Air Force or Army units. The Navy would also have less capability to attack enemy submarines, although that may be acceptable in a period when tensions with the Soviet Union are decreasing. Moreover, decreases in the number of submarines and surface ships assumed under Alternative 2 would reduce the Navy's capability to attack surface targets with cruise missiles launched at sea.

APPENDIX

TABLE A-1. ADMINISTRATION'S ACQUISITION PROGRAM FOR SELECTED AIRCRAFT
(In units procured and millions of current dollars)

Category	Administration's Plan						
	A-6 Mods	F/A-18 C/D's	F/A-18 E/F's	AX[a]	ATF[a]	NATF[b]	B-2
Total Program Acquisition Quantity [c d]	–	1,165	202	a	a	0	75
Total Program Acquisition Cost	5,000	42,500	20,500	a	a	200	64,800
Program Acquisition Unit Cost	–	40	100	a	a	b	860
Total Procurement Cost	5,000	39,700	16,400	a	a	0	41,800
Procurement Unit Cost	–	30	80	a	a	b	560
Total R&D Cost	0	2,800	4,000	14,300	16,800	200	21,900
FY92 Program Cost	1,200	2,500	400	0	1,600	0	4,900
FYDP Program Cost	2,200	13,400	8,300	3,500	13,500	0	30,000

Source: Congressional Budget Office and Department of Defense budget data.

a. The Administration has not provided AX and ATF procurement budget data.
b. The Administration has cancelled the NATF program.
c. Navy procurement supports both the active Navy and Marine Corps, as well as the Reserves.
d. The Navy has indicated that eventually between 500 and 1,000 E/F aircraft will be purchased.

TABLE A-2. ESTIMATES OF ACQUISITION AND STEADY STATE OPERATING AND SUPPORT COSTS FOR SELECTED AIRCRAFT (In millions of dollars)

Category	Administration's Plan As Estimated by CBO						
	A-6 Mods	F/A-18[a] C/D's	F/A-18[a] E/F's	AX[b]	ATF[c]	NATF[d]	B-2
Total Program Acquisition Quantity [e]	n.a.	1,327	372	370	650	546	75
Current Dollars							
Total Program Acquisition Cost	5,000	50,500	33,900	73,200	91,600	72,000	64,800
Program Acquisition Unit Cost	n.a.	40	90	200	140	130	860
Total Procurement Costs	5,000	47,700	29,900	59,000	74,800	65,100	41,800
Procurement Unit Cost	n.a.	40	80	160	120	120	560
Total R&D Cost	0	2,800	4,000	14,300	16,800	6,900	21,900
FY92 Program Cost	1,200	2,500	400	0	1,600	100	4,900
FYDP Program Cost	2,200	13,400	8,300	3,500	13,500	4,200	30,000
Constant 1992 Dollars							
Total Program Acquisition Cost	f	58,200	25,100	48,300	59,800	45,500	66,900
Program Acquisition Unit Cost	n.a.	40	70	130	90	80	890
Total Procurement Cost	f	53,100	21,400	37,000	48,100	39,800	40,200
Procurement Unit Cost	n.a.	40	60	100	70	70	540
Operating and Support (O&S) Operating Quantity [g]	220	220	h	220	396	220	68
Steady State Annual (O&S) Cost [h]	670	760	h	670	1,530	670	860
25-Year O&S Cost	16,750	19,000	h	16,750	38,250	16,750	21,500
Total Program Acquisition and 25-Year O&S Cost	n.a.	77,200	h	65,100	98,100	62,300	88,400

Source: Congressional Budget Office.

Note: n.a. = not applicable.

a. Recent CBO testimony assumed an E/F program quantity of 372 aircraft and continued C/D procurement.
b. Recent CBO testimony assumed an AX program quantity of 370 aircraft.
c. Recent Air Force testimony has indicated that the ATF program quantity will be 650 aircraft.
d. The NATF program quantity is based on the 1990 Major Aircraft Review plan to buy 546 aircraft.
e. Navy procurement supports both the active Navy and Marine Corps, as well as the Reserves.
f. Data are not currently available.
g. Operating quantity based on the number of primary aircraft authorized (PAA). The Navy is contemplating a transitional air wing that could increase the number of PAA in this table.
h. Steady state operating and support costs are based on the following assumptions:
   - o CBO assumed E/F and C/D models of the F/A-18 would have the same operating costs.
   - o AX aircraft will cost the same as it now costs to operate A-6 aircraft.
   - o ATF and NATF aircraft will cost the same as it now costs to operate F-15 and F-14, respectively.
   - o B-2 aircraft will cost 30 percent more than the B-1 aircraft to operate. In addition, the cost is based on an operating tempo of flying each B-2 230 hours a year.